

Developing Reference Water Quality Conditions for the Pueblo de Taos, New Mexico

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Purpose and Structure

This Presentation will focus on the process used to develop reference water quality conditions on the Pueblo of Taos reservation. We will cover three areas today

- Part I: Overview of tribal history and the importance of Clean Water to our Lifeway,
- Part II: Design of the assessment program,
- Part III: Assessment of water quality data and next steps.

The 19 Pueblos of New Mexico

Northern Pueblos

Taos
Picuris
Santa Clara
Ohkay Owinegh
Nambe
Pojoaque
San Ildefonso
Tesuque



Southern Pueblos

Cochiti
Isleta
Sandia
San Felipe
Santa Ana
Santo Domingo
Zia
Jemez

Western Pueblos

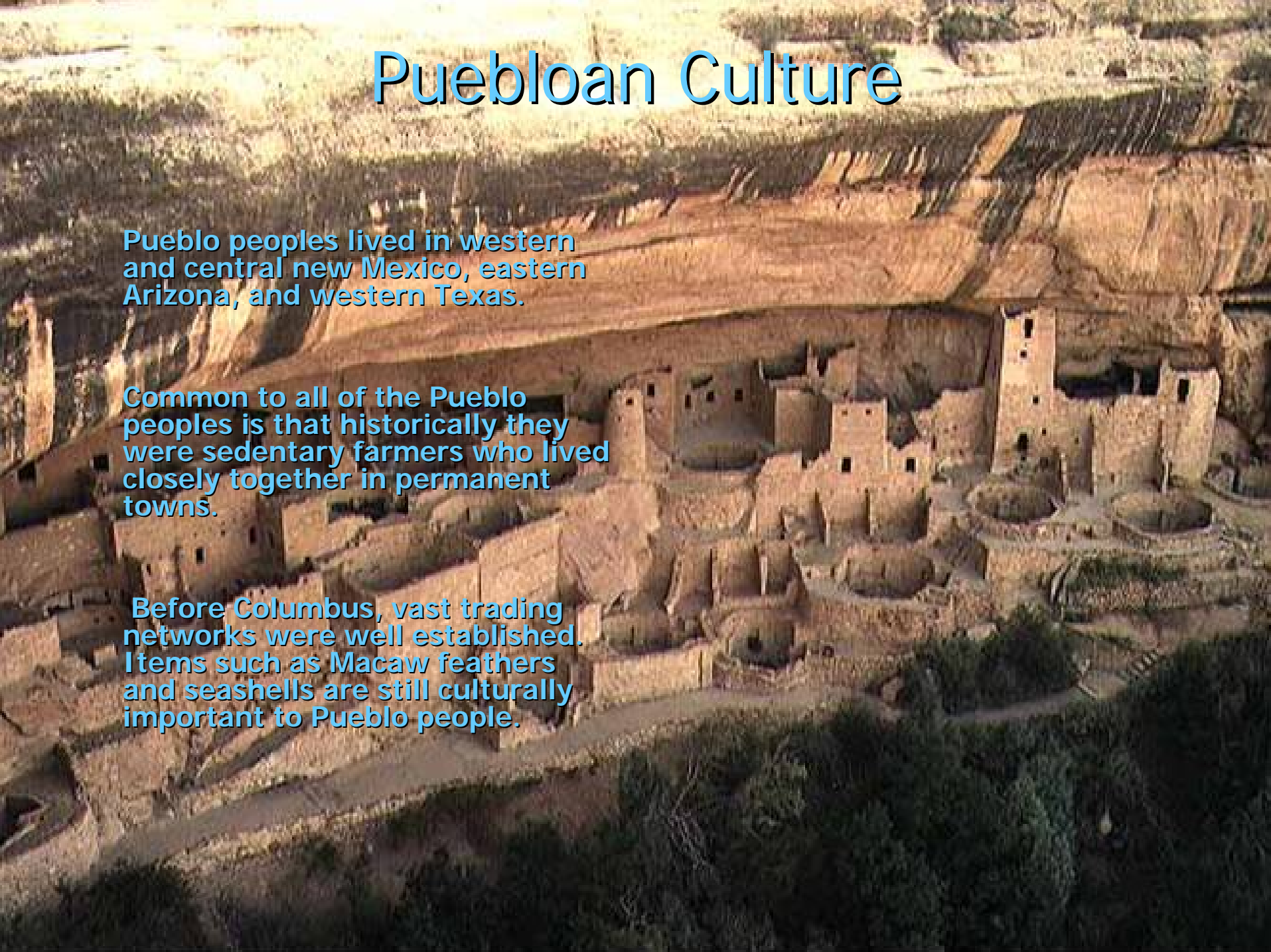
Acoma, Laguna, Zuñi,

Puebloan Culture

Pueblo peoples lived in western and central new Mexico, eastern Arizona, and western Texas.

Common to all of the Pueblo peoples is that historically they were sedentary farmers who lived closely together in permanent towns.

Before Columbus, vast trading networks were well established. Items such as Macaw feathers and seashells are still culturally important to Pueblo people.

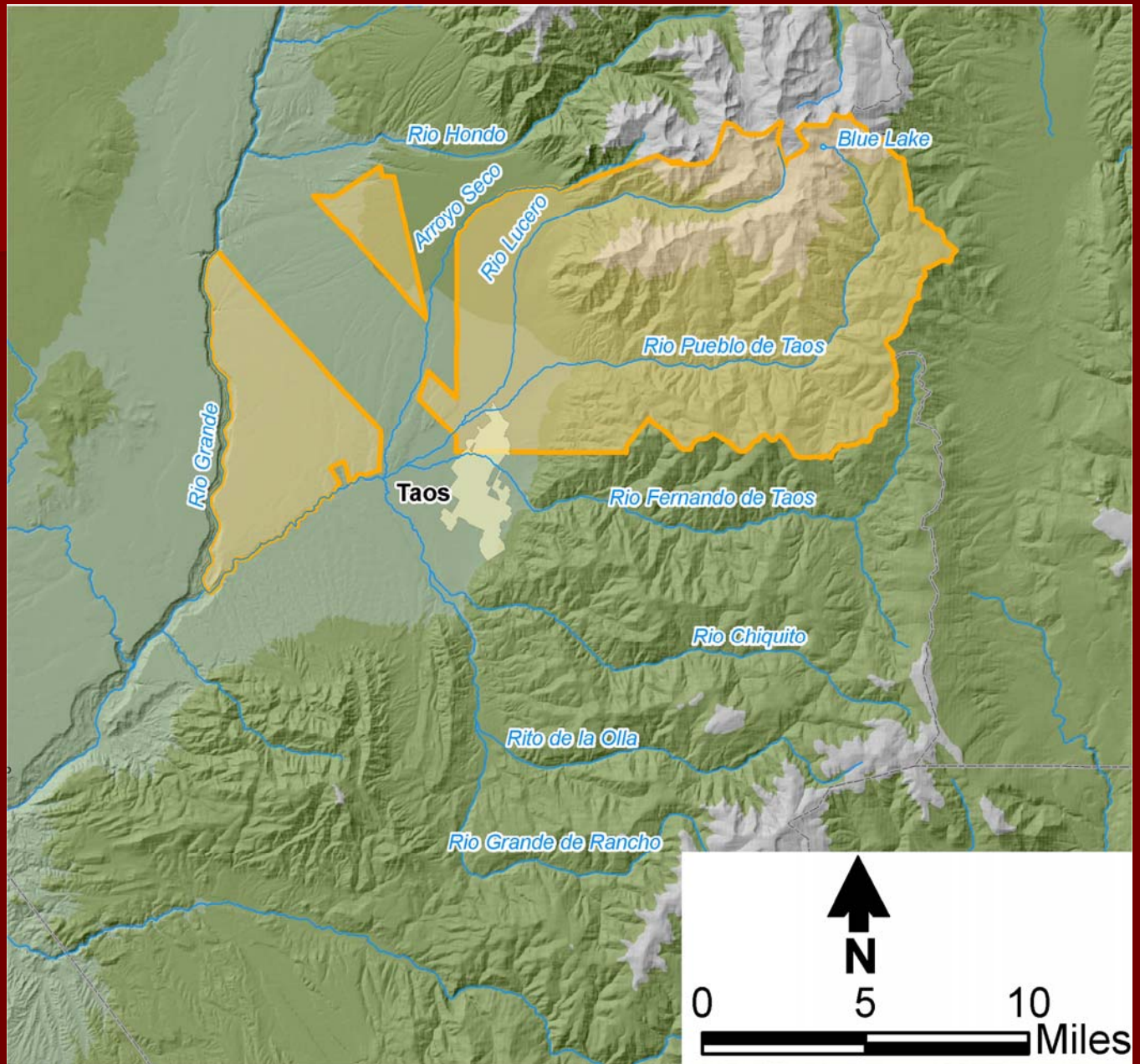


Pueblo of Taos

Community Profile

- Located in North Central New Mexico
- Designated UNESCO World Heritage Site (1992)
- National Register of Historic Places (1960)
- Largest of the Eight Northern Pueblos in population and land base
- Tribal Enrollment: 2,410 members
- Elevation: 7,600
- 119,000 acres

Taos Pueblo Area Map



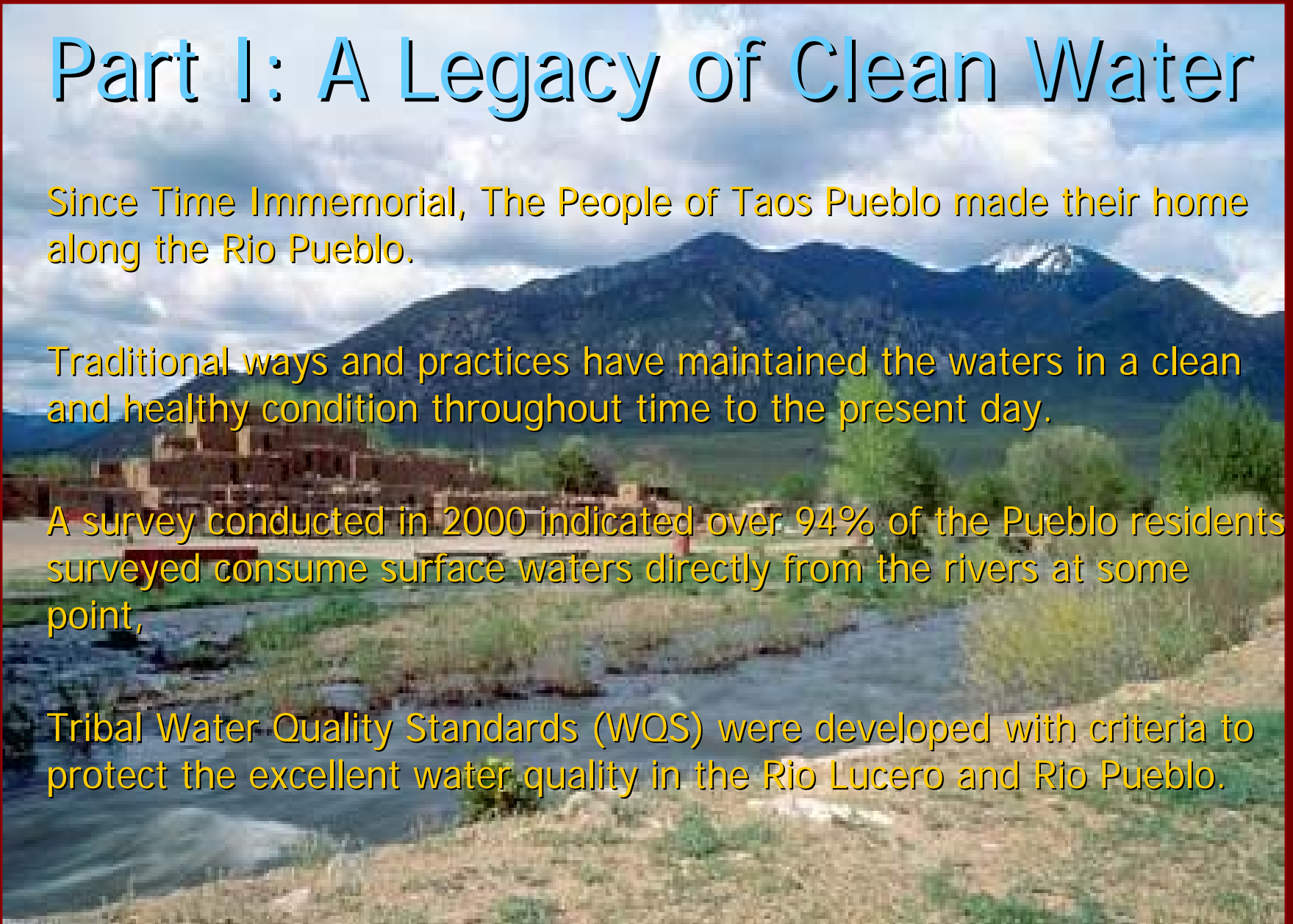
Part I: A Legacy of Clean Water

Since Time Immemorial, The People of Taos Pueblo made their home along the Rio Pueblo.

Traditional ways and practices have maintained the waters in a clean and healthy condition throughout time to the present day.

A survey conducted in 2000 indicated over 94% of the Pueblo residents surveyed consume surface waters directly from the rivers at some point,

Tribal Water Quality Standards (WQS) were developed with criteria to protect the excellent water quality in the Rio Lucero and Rio Pueblo.

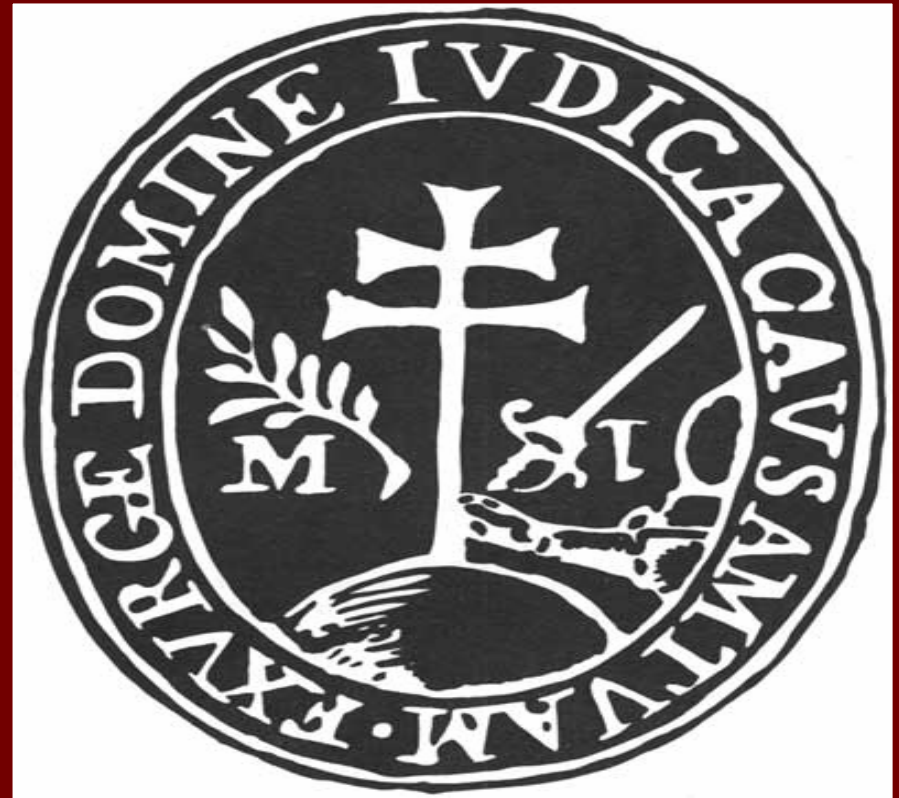


European Conquest

Beginning around 1540, Alvarado, Coronado, and Oñate entered the region, subdued the population, and established the first permanent European settlement near the Tewa pueblo of *Okhay Owingeh*.

Spanish settlers and priests tried to replace the native beliefs of the Pueblo peoples with European Christianity,

One of the first religious offices established in Mexico City in this period was the Inquisition.



Seal of the Mexican Inquisition

1680 Pueblo Revolt

- After many years of oppression and slavery, Pueblo leaders planned an overthrow of the hated Spanish.
- Popay (Ripe Pumpkin), a Tewa is credited with being the mastermind in the first American Revolution,
- The Spanish were exiled for period of 12 years, until the 1692 *Reconquestia*.

Pueblo Revolt Aftermath

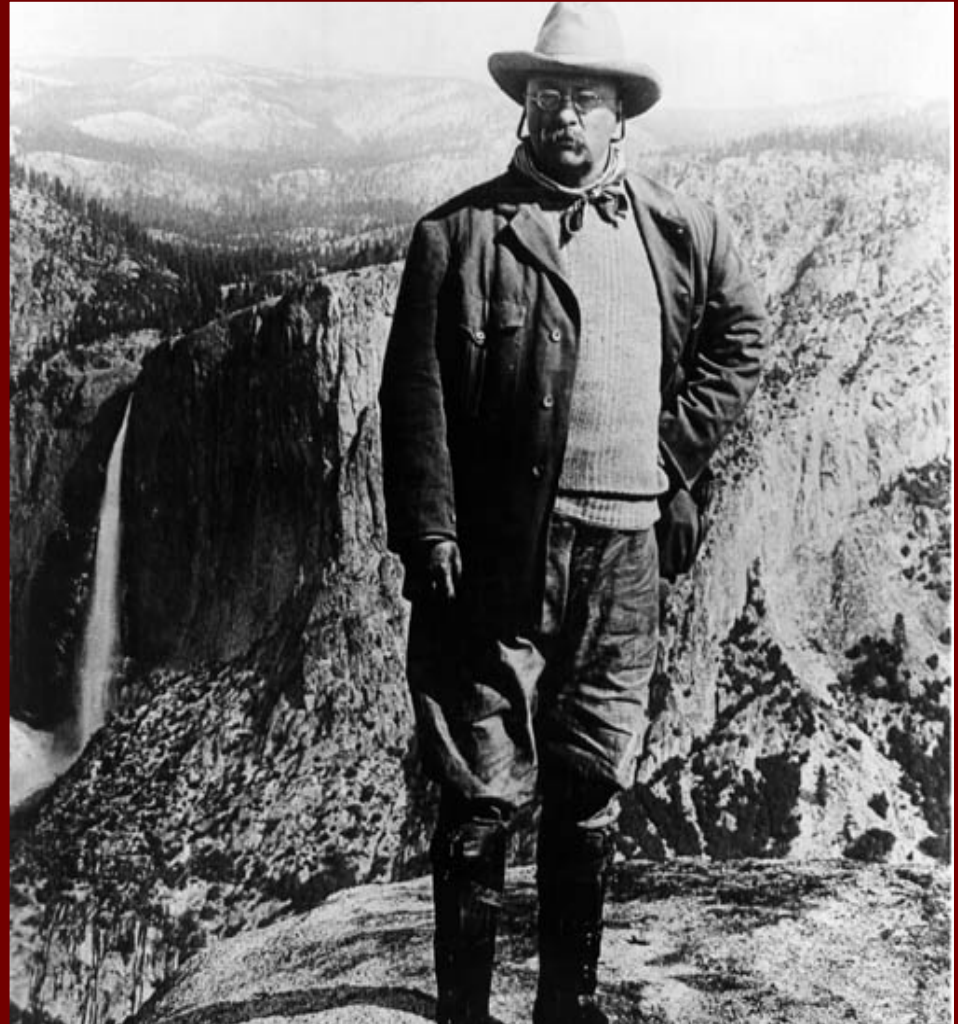
- The Pueblo Revolt brought about new attitudes from the Spanish towards the Indians,
- Pueblos were granted tracks of land, 3 *varas* (app 3 miles) in each cardinal direction from their church door as their land grant from the King of Spain,
- Catholicism and the Pueblo religion were allowed to co-exist.

American Period

- Early in the 1800's, French and American trappers began wandering into the region,
- After the 1848 Mexican War, the Treaty of Guadalupe Hidalgo, recognized Pueblo land grants.
- Rights such as voting were not extended to the Indians.
- Indian religious practices were considered un-Christian therefore un-American.

The 65 year struggle for the Return of the sacred Blue Lake

Blue Lake and its surrounding forests and mountains have been a religious shrine for centuries before the European arrival; but in 1906 nature-loving, Indian-hating Theodore Roosevelt had incorporated the lands the national forest system.



Taos Pueblo Elders Spoke

- “In all of its programs the Forest Service proclaims the supremacy of man over nature; we find this viewpoint contradictory to the realities of the natural world and to the nature of conservation.....The idea that man must subdue nature and bend its processes to his purposes is repugnant to our people.” – Testimony of the Taos Pueblo delegation to Congress.

Clash of Traditional and Modern

Under the USFS Multiple Use Policies, timbering, grazing, mineral exploration, and pollution from non Indian sportsman became a big problem.

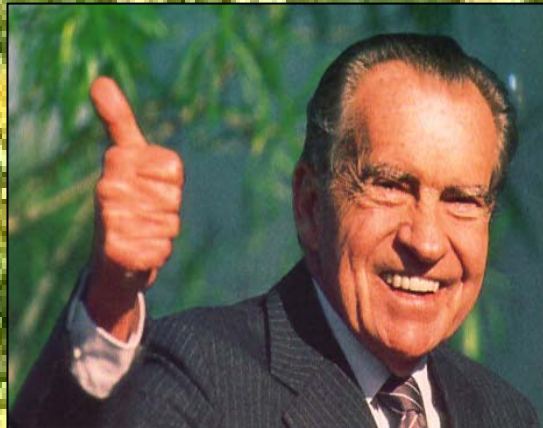
“We have always practiced conservation of those watersheds; they yield clear water today because of our long-standing care. Today it is more important than ever that the natural condition of those watersheds be preserved as the source of pure water in those streams.

Our life depends upon that water even more than does the welfare of the non-Indians downstream because we obtain our drinking water directly from the Rio Pueblo.”

– Excerpt from Congressional Testimony. Taos Pueblo Delegation

A Landmark Victory

- In 1970, after much lobbying and perseverance, the sacred Blue Lake was returned to Taos Pueblo by President Nixon under PL 91-550.
- Since the return, the 48,000 acre tract has been managed per the Wilderness Act.
- Other progressive policies of the Nixon era included passage of PL 93-638, The Indian Self Determination Act.



Part II: Developing Baseline Conditions

- In 1990, Taos Pueblo and the rest of the 8 Northern Pueblos of New Mexico submitted applications for Treatment as a State pursuant to 1987 Reauthorization of the Clean Water Act §518.
- Shortly thereafter the Pueblo of Isleta's WQS were approved by EPA.
- The 8 Northern Pueblos consortia developed a set of generic WQS based on the New Mexico WQS, Taos opted out and choose to develop a set of standards specific to its lands and Existing and Designated Uses.

Designing an Assessment Program

- Until the mid 1990's, no monitoring program existed,
- With the help of River Watch Network (now River Network), a non profit watershed conservation organization, Taos Pueblo developed a Watershed Study Design.
- The Watershed Study Design is a living document and meant to be revised and revisited throughout assessment process.

Rationale of Watershed Study Design

- Helps to focus on what is to be accomplished in assessment,
- Helps to select most appropriate strategy to address important issues,
- Prevents waste of time and money
- Allows new personnel to 'pick up threads',
- Provides information that can be easily translated into a QAPP.

Study Design is an Assessment Process

- Establish your Expectations, e.g. rivers should be able to....
- Determine Current Conditions (watershed assessment),
- Move your data to information
- Use the information to Tell the Story (information into knowledge).
- Revisit Assessment document - Important

Establishing Expectations

- In this phase the tribe asks what are the goals for the watershed.
- Traditional tribal knowledge was incorporated into monitoring design, e.g., known river use sites, drinking water, herbs collected there, etc.,
- Traditional knowledge is used to establish Designated Uses in WQS as well.

Determine Current Conditions

- In the next phase, we gathered existing information on watershed stressors and response indicators, this is a good time to talk to the community, esp. elders.
- Examples are state 305b and 303d lists, agency data, etc.
- Gather new information, measure or observe stressors, such as riparian vegetative buffer, presence of algae blooms, etc.
- For example, GAP or CWA 104b funding can be used to train staff and yet yield valuable information.

Tell the Story: Information to Knowledge

- Assessment results were used to develop a protection/restoration plan to:
 - Share some knowledge gained from listening experiences,
 - To develop a plan to protect health waters and restore impaired waters.

Revisit Assessment Regularly

- Are Goals being met?
- Are your methods correct?
- Is your data meeting DQO's?
- Is Information turning into knowledge?
- Revise and Repeat.

Ways tribes could use information

- Education and awareness
- Baseline Data Collection
- Planning Watershed Restoration and Protection efforts
- Developing culturally specific WQS
- Evaluate watershed restoration and protection efforts, e.g. BAER treatments

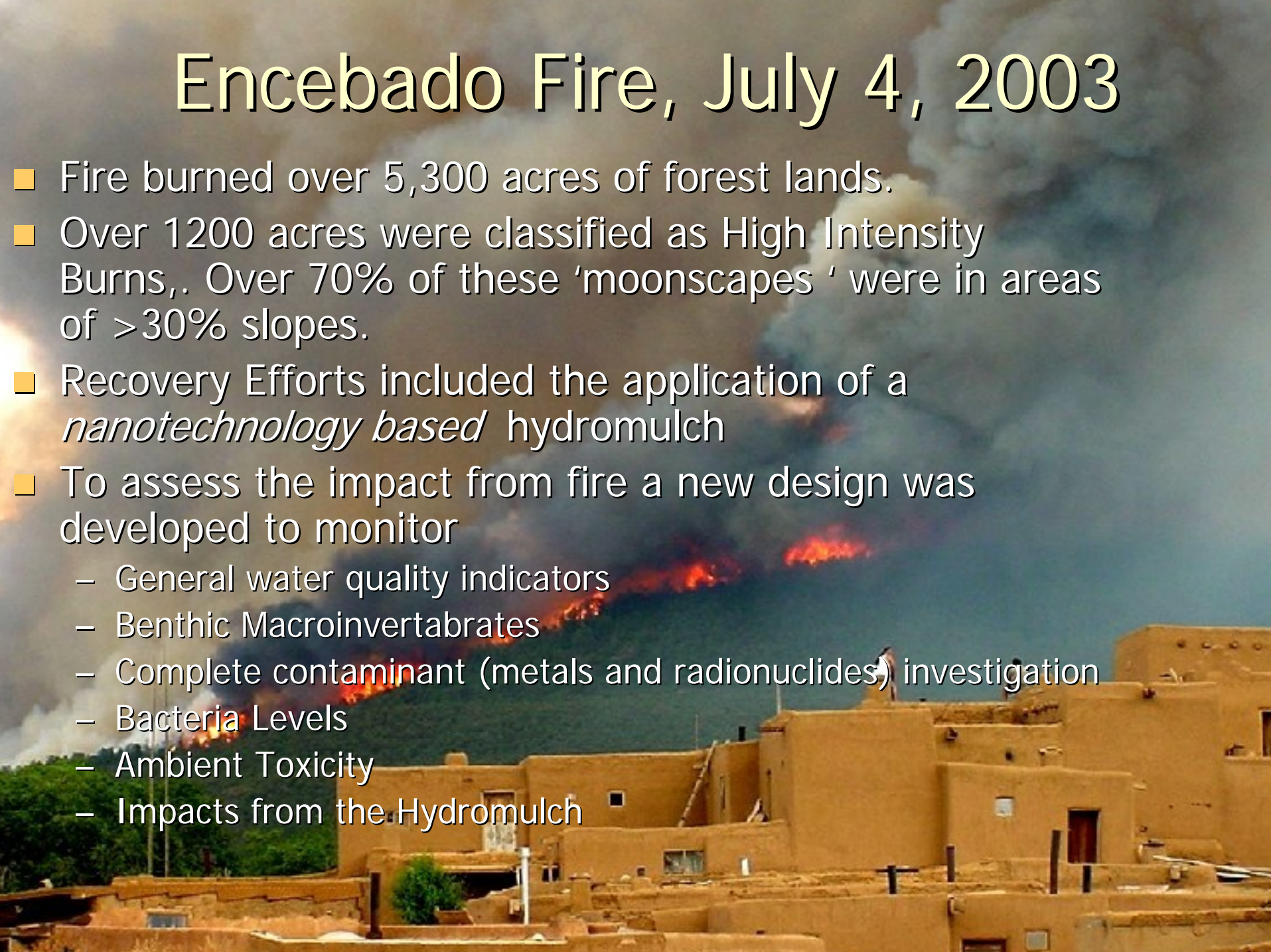
Baseline Database

At this stage, we were the only group with the authorization to assess ambient water quality conditions on the Pueblo de Taos reservation.

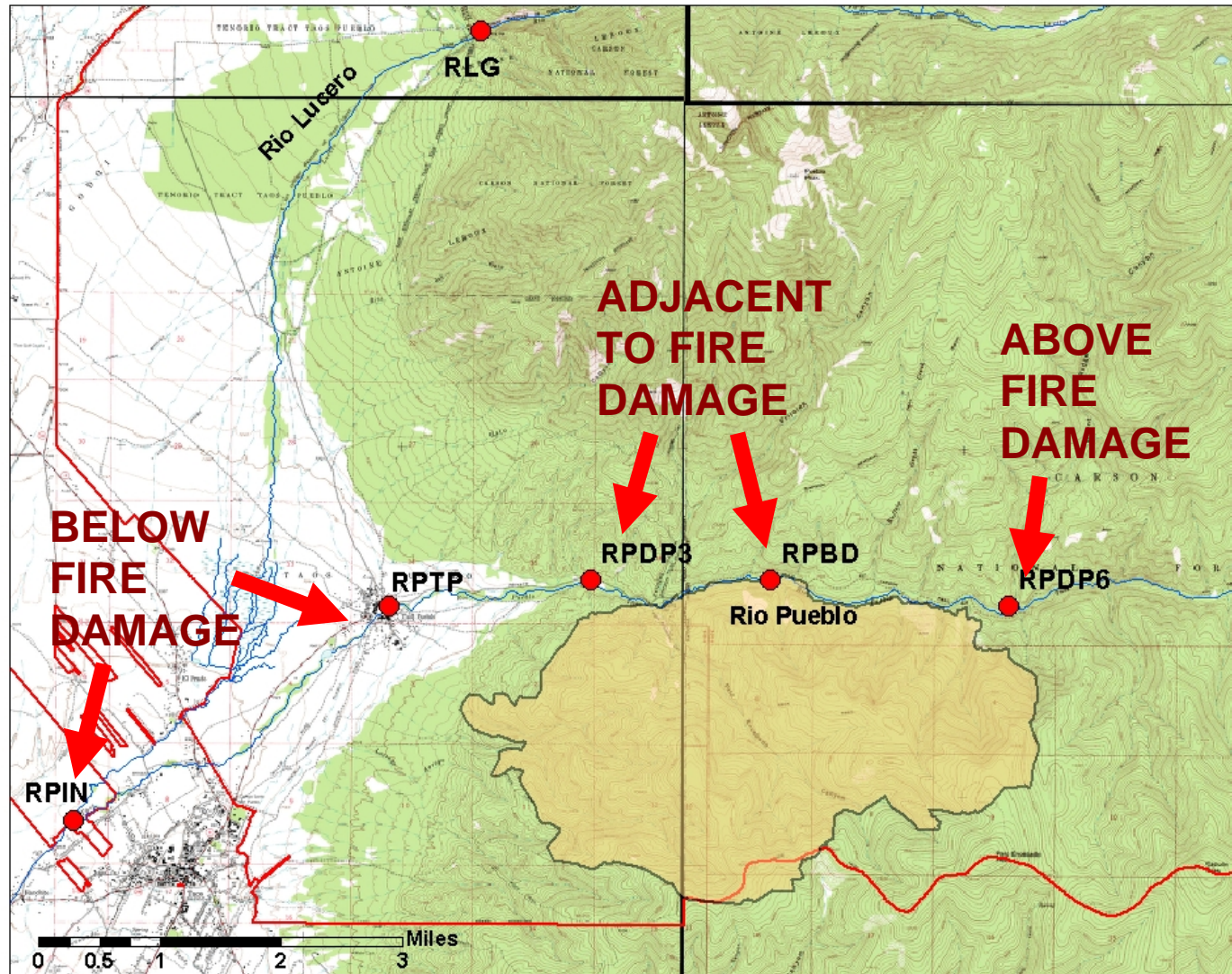
- Watershed Study design resulted in a common sense, implementable plan acceptable to EPA.
- Monitoring plan to determine attainment of WQS included an approach focused on the benthic macroinvertebrate communities in the Rio Lucero and Rio Pueblo rivers.
- In addition, nutrients and basic water quality indicators were to be sampled on a biweekly basis,

Encebado Fire, July 4, 2003

- Fire burned over 5,300 acres of forest lands.
- Over 1200 acres were classified as High Intensity Burns,. Over 70% of these 'moonscapes ' were in areas of >30% slopes.
- Recovery Efforts included the application of a *nanotechnology based* hydromulch
- To assess the impact from fire a new design was developed to monitor
 - General water quality indicators
 - Benthic Macroinvertebrates
 - Complete contaminant (metals and radionuclides) investigation
 - Bacteria Levels
 - Ambient Toxicity
 - Impacts from the Hydromulch



TPEO Water Quality Sampling Locations 2003-2004





HYDROMULCH

Sequoia Pacific
Research Company L.L.C.

- Under the Burned Area Emergency Rehab plan, a aeri ally applied hydromulch treatment was specified.
- The product is marketed to use “nanotechnology” in its function
- Due to proprietary rights and US patent law, the company is not required to reveal what is in the product, but maintains the main ingredient is ubiquitous in the environment.
- We will continue to investigate the situation



EPA Acute Toxicity Test



- Since 2003, EPA accepted a sample site from the Rio Pueblo for under the Ambient Toxicity Monitoring Program.
- Sediment and water samples were taken in the Rio Pueblo and toxicity was measured in Ceriodaphnia and Pimephales.
- On two separate occasions, Significant Mortality was documented in the samples we sent to the lab. In areas below the Palo Encebado Canyon.

Post Fire Monitoring

- Citizen concerns with the impact of the fire on water quality of the Rio Pueblo, particularly for drinking and ceremonial purposes,
- After the fire, TPEO changed the sampling design sites bracketed areas above the fire damage and compared to several site next to and below the fire damage.

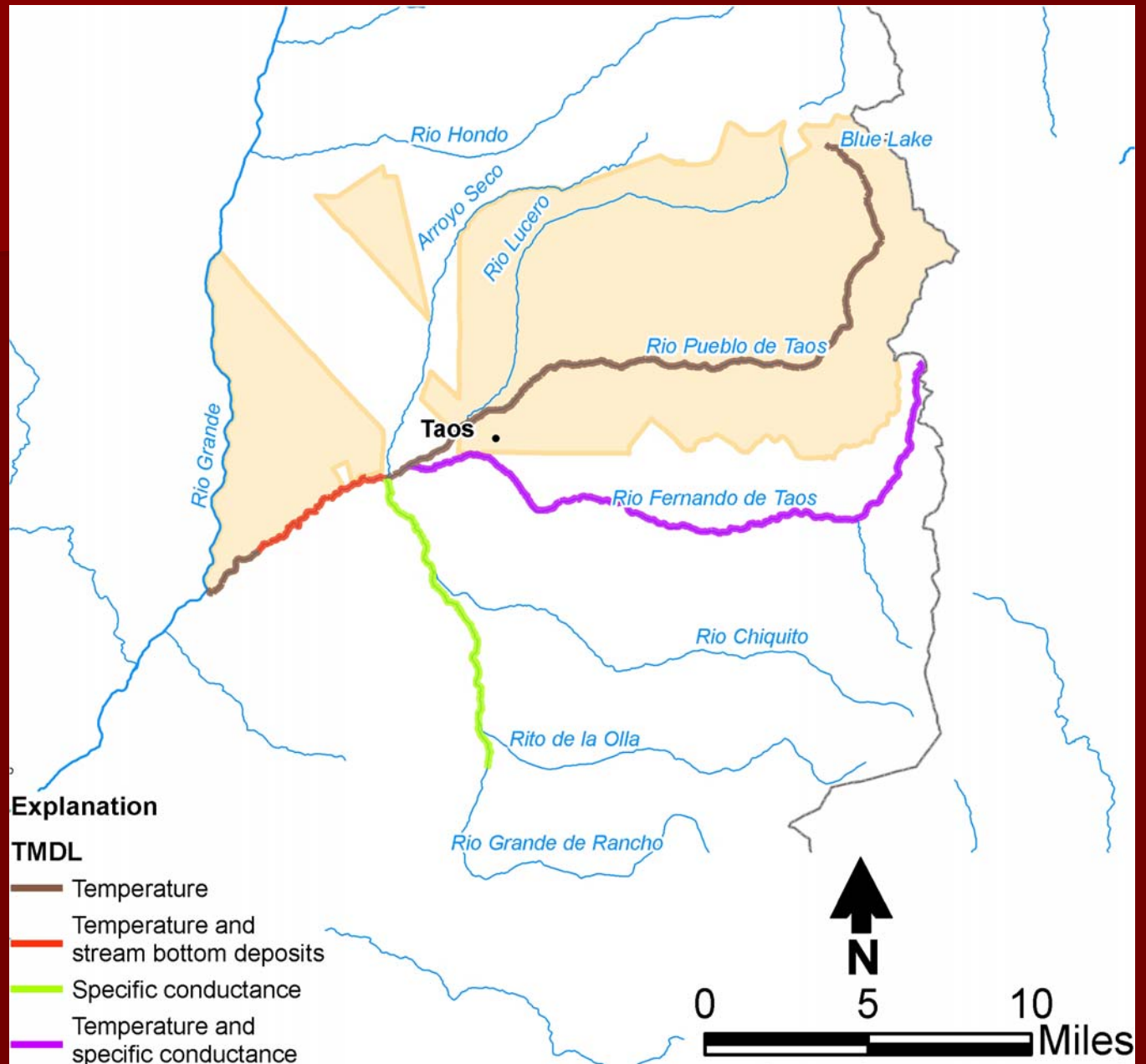
Ongoing Concerns

- Fire Recovery - Ongoing sediment deposition in stream bottoms.
- Fish population appears to have been reduced in areas below Encebado Fire.
- Significant Toxicity results on two separate samples submitted in Ambient Toxicity program,
- Anxiety about hydromulch persists in community, and its use as a source of drinking water.
- E. Coli levels in river reached an all time high.

Part III: Tying it all Together

- Several seasons of data were analyzed after staffing became stable,
- Taos Pueblo has been writing 305b style reports for several years
- We also have been uploading data to STORET since 2005.
- In house tools use basic spreadsheets and off the shelf statistical analysis software.

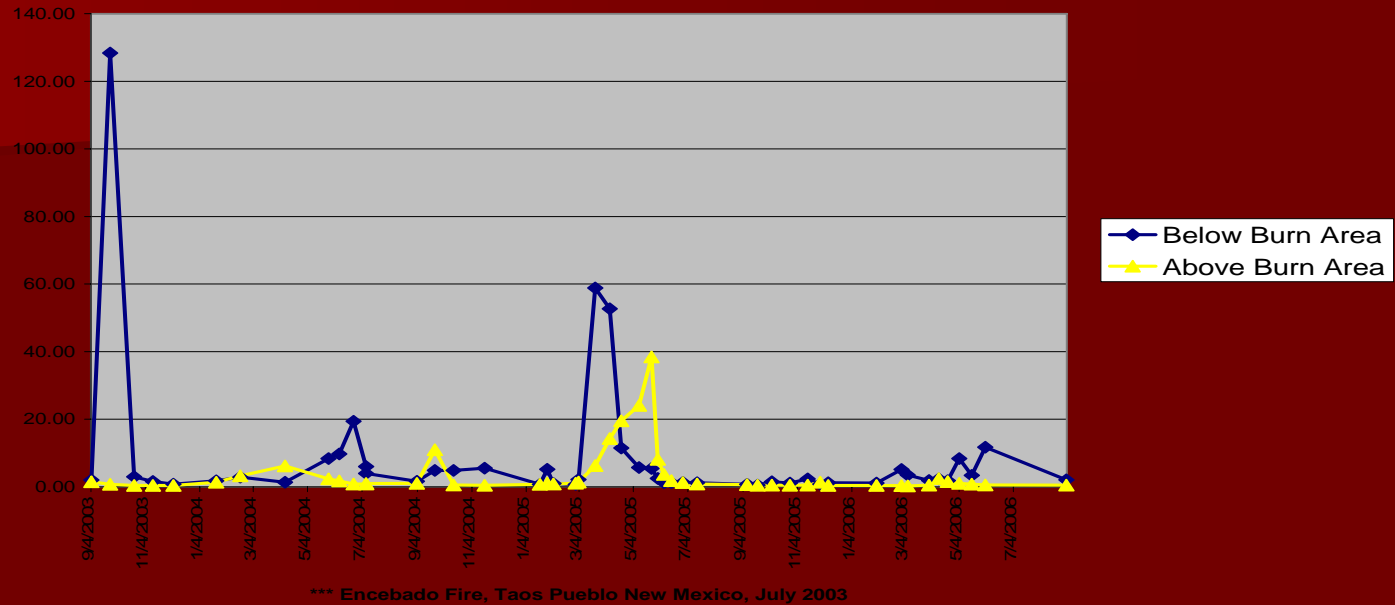
Water Quality Impaired Reaches near Taos Pueblo



Taos Pueblo Water Quality Standards

- Adopted by Taos Pueblo on December 2001
- Designates existing and attainable uses for Pueblo waters, including OTRW.
- Sets numeric and narrative standards associated with tribally determined Designated Uses,
- Taos Pueblo Water Quality Standards approved by EPA in June 2006.

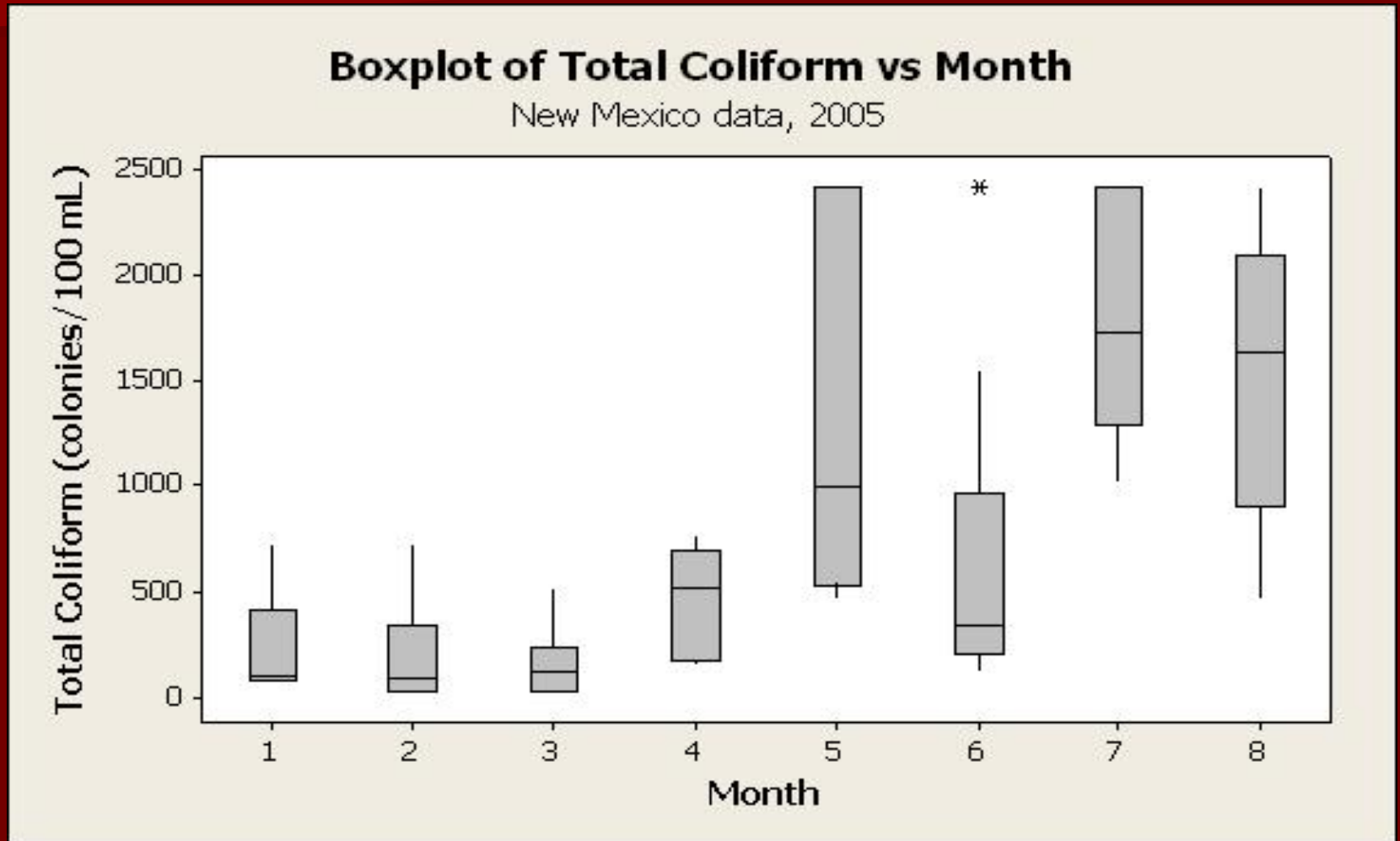
Turbidity Levels Above, Beside, and Below the Encebado Burn Area, Taos Pueblo, NM



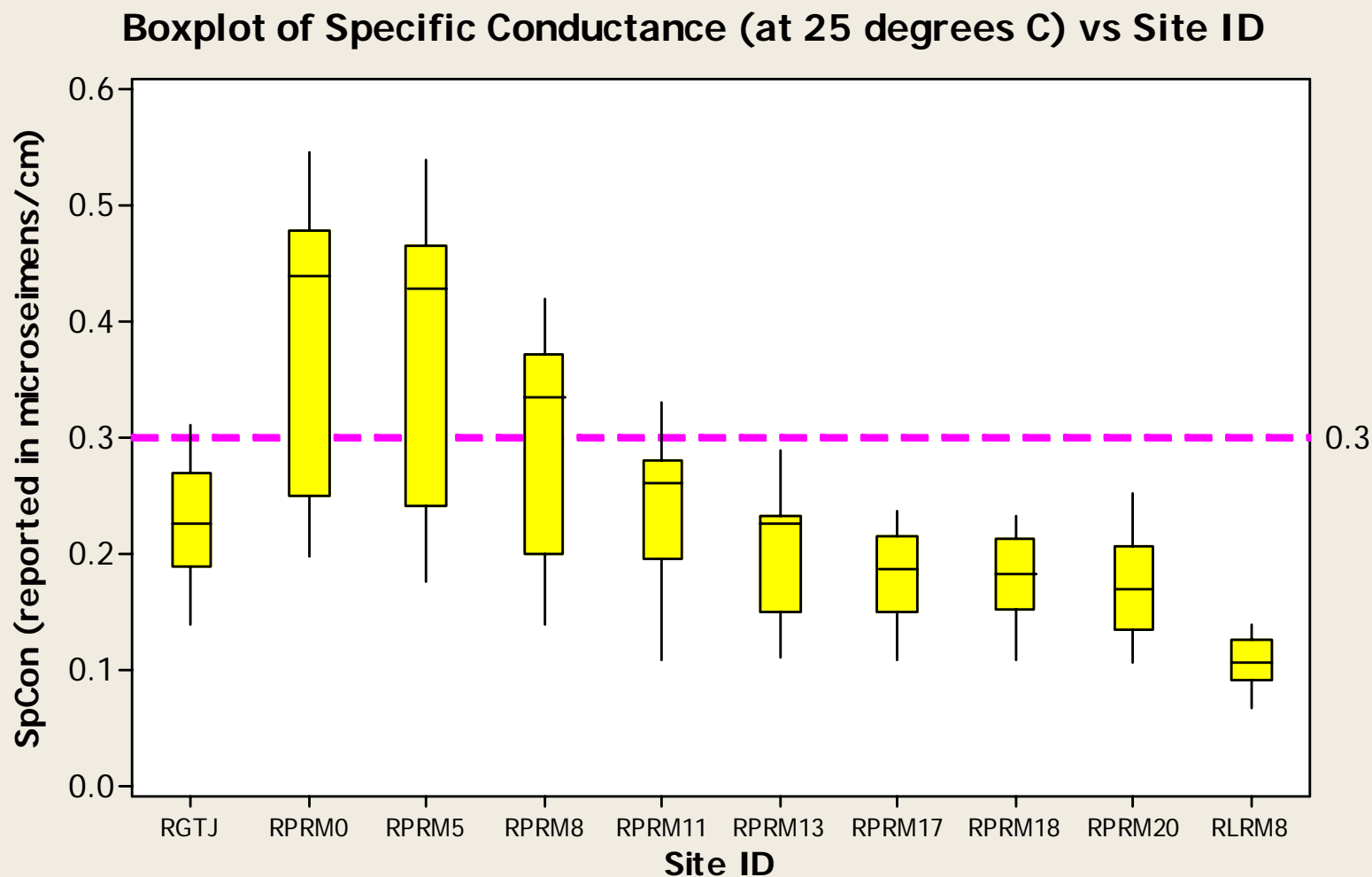
*** Encebado Fire, Taos Pueblo New Mexico, July 2003



Presenting Findings: Coliform levels at Taos Pueblo village

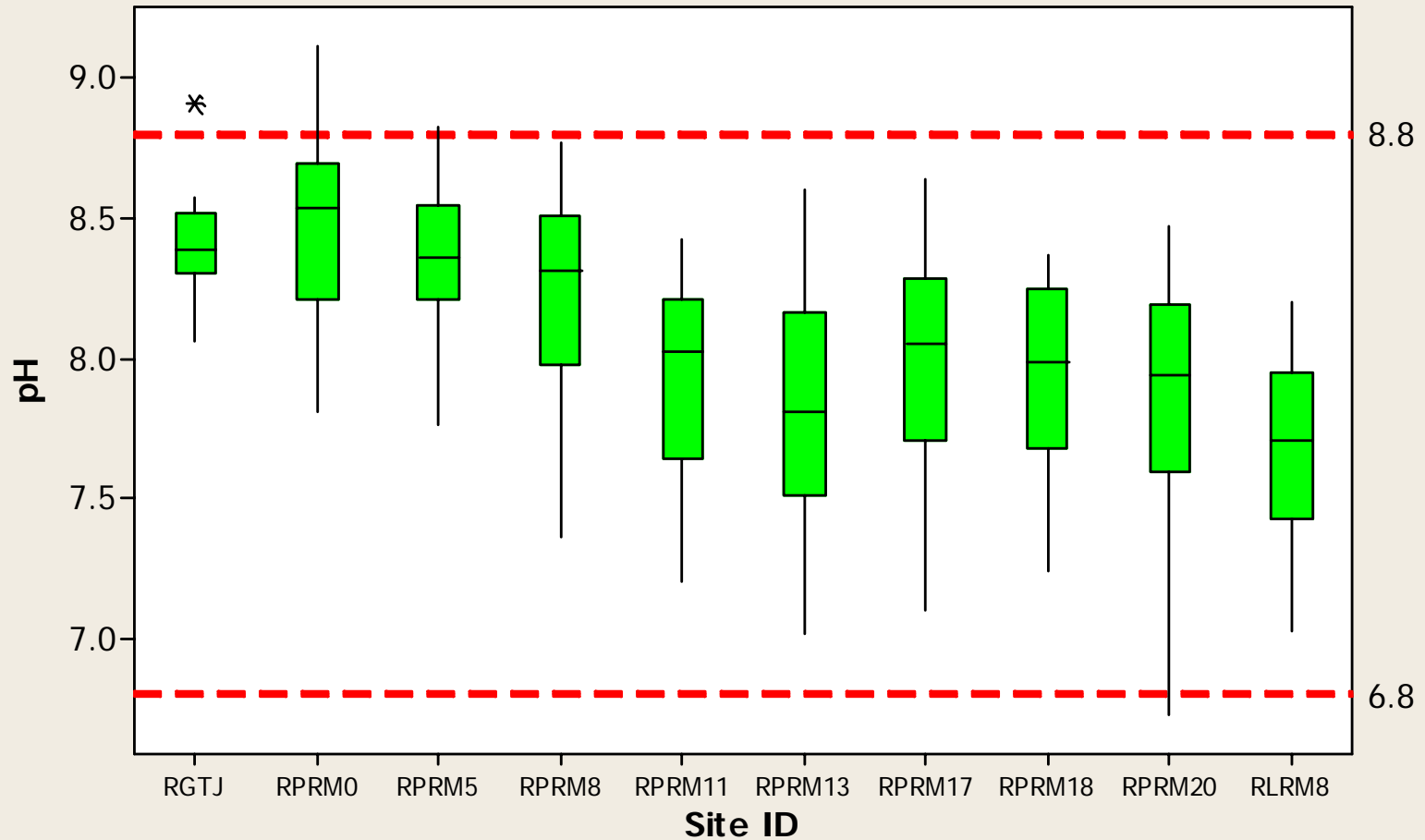


Specific Conductance

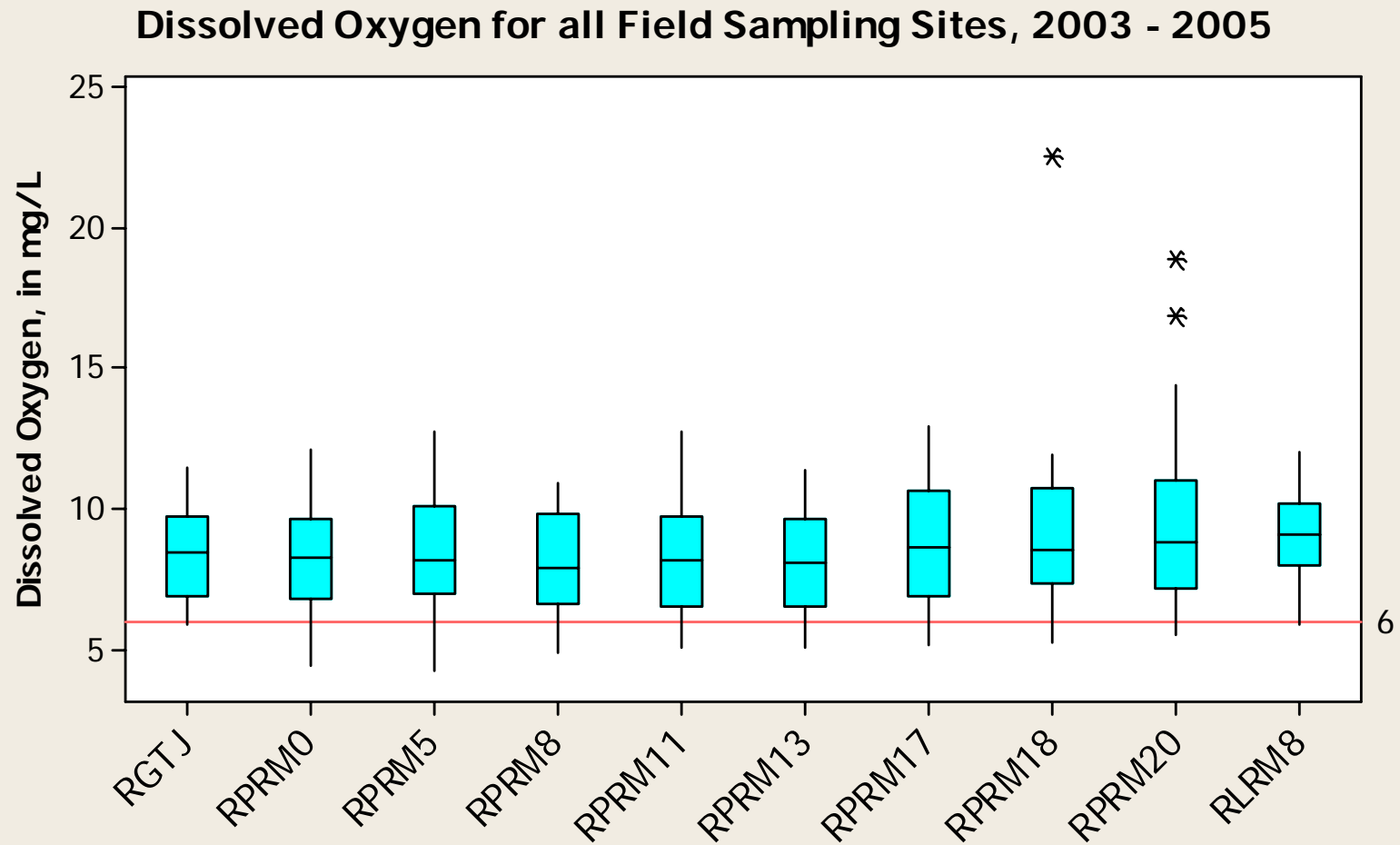


pH

Boxplot of pH vs Site ID

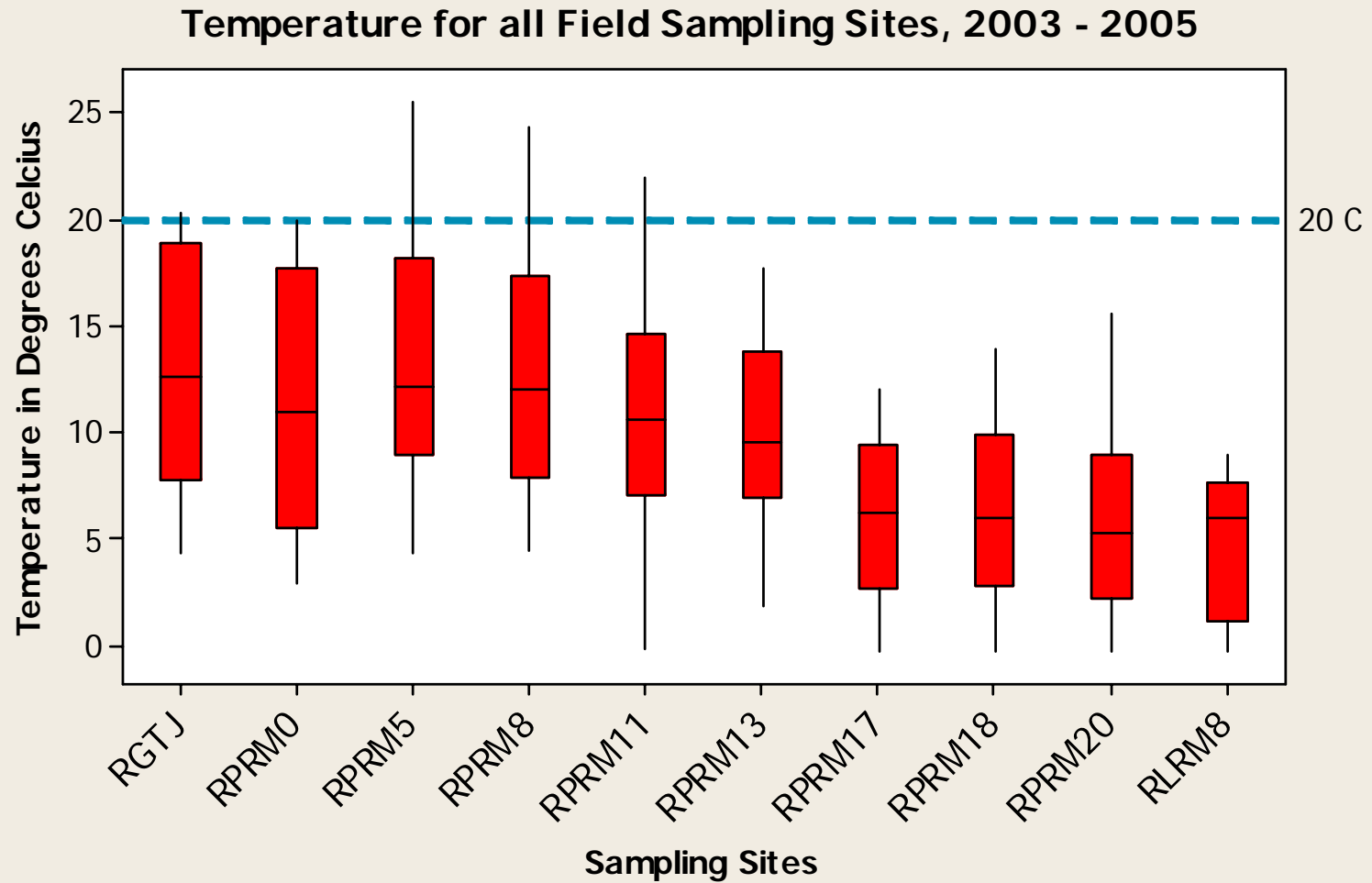


Dissolved Oxygen



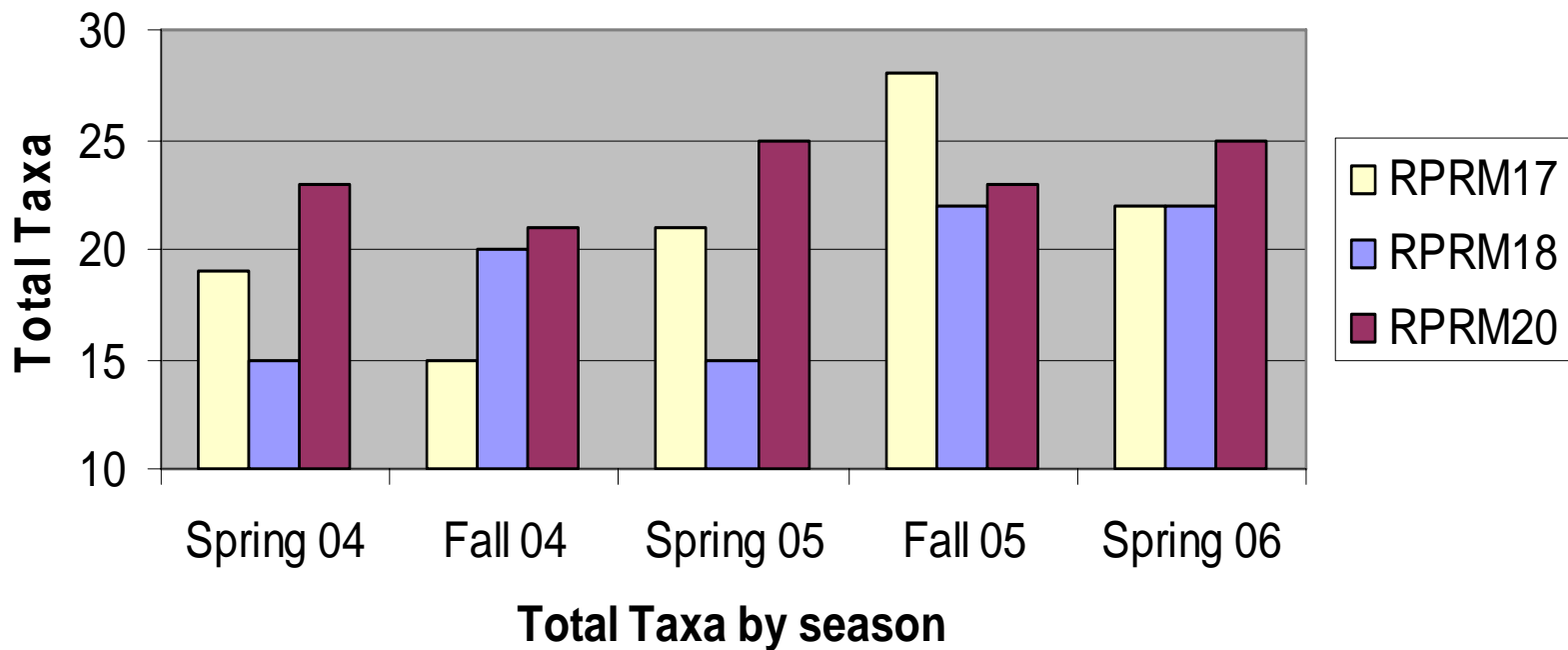
* 6.0 mg/L Minimum Standard for Cold Water Fishery *

Temperature



Total Taxa 2004-2006

Total Taxa Richness bracketing Encebado Fire Area



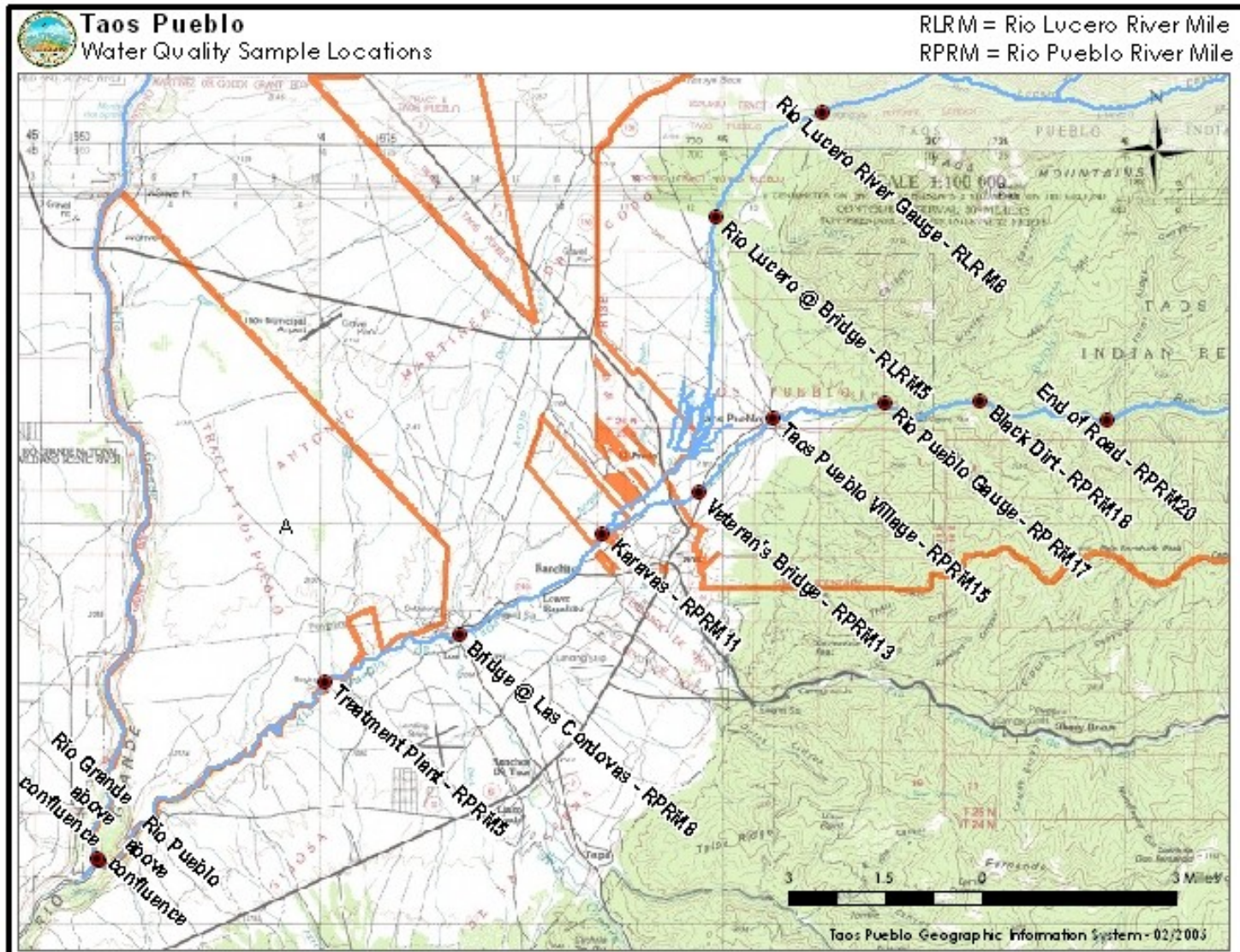
Water Quality in the Rio Pueblo

- Water quality at Taos Pueblo is considered good to excellent for most parameters at most sampling locations,
- Occasional readings are recorded outside acceptable ranges, long term monitoring to look at patterns and trends,
- Water quality degrades as it moves downstream,
- Long term fire impacts are documented and reported to tribal government.

Full Contaminant Examination Results

- Of all the compounds examined, only two were at levels high enough to be concerned:
Radium- 228 and **Aluminum**
- Both had levels that slightly exceeded the WQS criteria.
- LANL scientists informed us that high levels of both are natural result of a fire and that amount of both contaminants will likely return to normal levels within the next 1-2 years.
- Radionuclides sequestered in vegetation were released when trees were ashed, and ran off to soils in the community.

FY 06 Sampling Locations



Need for Cooperation and Coordination

- Below the Town of Taos, the state of New Mexico has written TMDL's for stream bottom deposits and temperature.
- According to New Mexico state law, the state boundary is defined as the middle of the channel.
- Portions of the Taos reservation are below the TOT and have the rivers as boundaries,
- Therefore, tribal WQS apply to these same waters.

Impaired Designated Uses

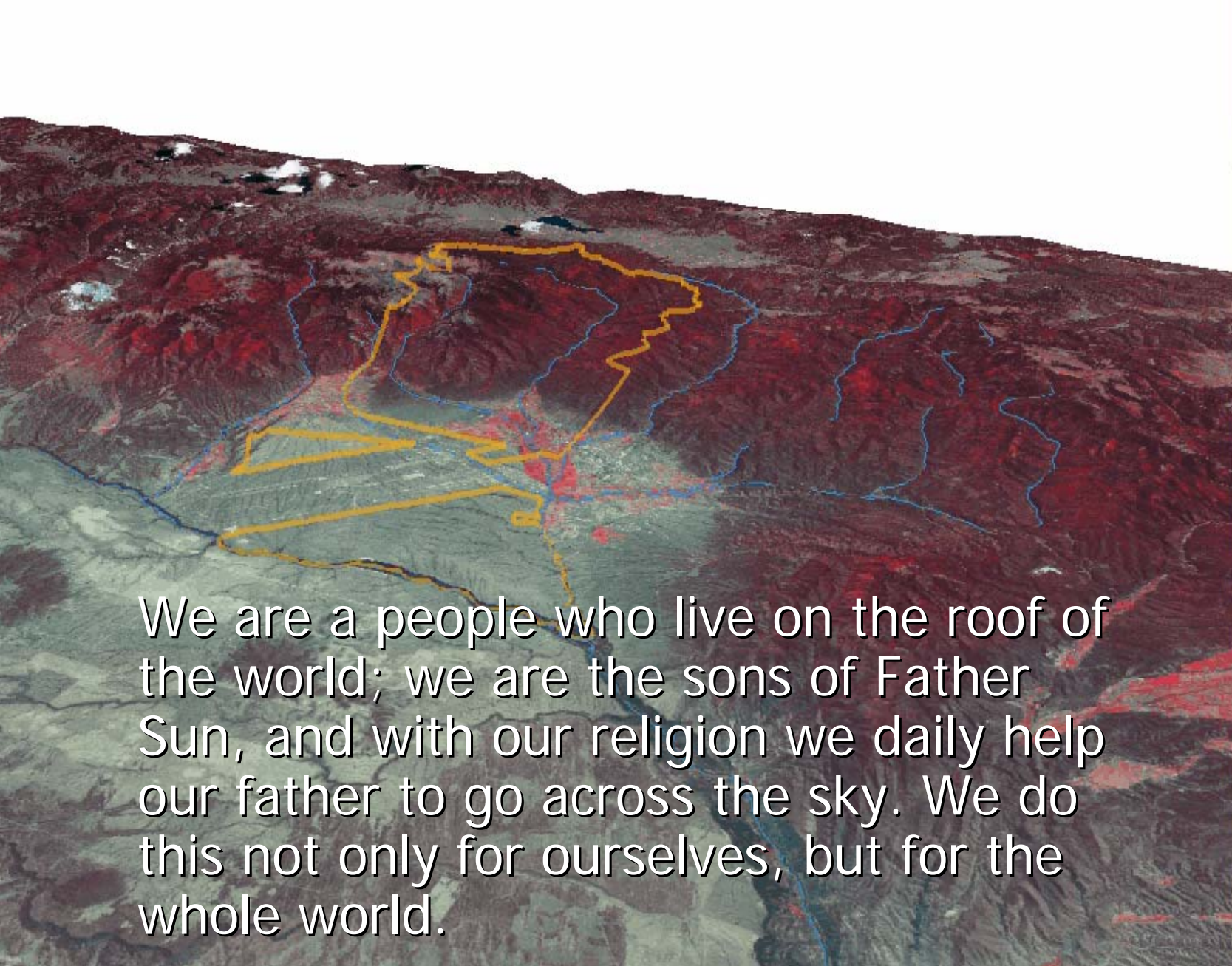
High quality coldwater fishery.

Impaired by: Temperature/Dissolved Minerals

Sources of Impairment: Recreation and Tourism Activities, Riparian and Upland grazing, septic tanks, natural sources, land disposal, land development, highway maintenance and runoff, habitat modification, grazing related sources, construction, bank and shoreline modification/de-stabilization, agriculture.

Development and Roads as Non Point Sources



An aerial photograph of a rugged, mountainous landscape. The terrain is covered in dense vegetation, appearing in shades of green and brown. A prominent yellow outline is drawn on the map, tracing a path or boundary across the mountains. Several blue lines are also visible, likely representing rivers or roads. The sky is a pale, hazy blue.

We are a people who live on the roof of the world; we are the sons of Father Sun, and with our religion we daily help our father to go across the sky. We do this not only for ourselves, but for the whole world.